# TRoUBLE? Trends of Rising and Unexpected Bloom Levels in the Estuary

**#0022**

# Technical Panel Review

***Proposal Name:*** TRoUBLE? Trends of Rising and Unexpected Bloom Levels in the Estuary

***Applicant Organization:*** United States Geological Survey

***Principal Lead Investigator(s):***
Cloern, James
Labiosa, Rochelle
Lucas, Lisa
Ralph, Cheng
Thompson, Janet
Jassby, Alan

***Amount Requested:*** $299,422

***TSP Panel Summary of Findings:***

**This proposal represents an important advance in the study and knowledge of San Francisco Bay. The study team is excellent with a great record of accomplishment. They have a proven record of delivering on promised results and represent some of the best modelers in the business. Developing more advanced models and combining physical and ecological models has the potential to provide a deeper understanding of those factors which drive the major changes recently observed in San Francisco Bay. This project has the potential for a large leap forward in our knowledge of why San Francisco Bay has recently undergone some dramatic and unanticipated changes. However, there are some issues of concern regarding this proposal. Foremost among them is that the postdoc tabbed to do most of this work does not have a proven track record in estuarine studies. While she will be supervised by some of the best modelers in the world, her lack of estuarine modeling experience is a concern. Another issue is the data coverage to drive the models. The models are only as good as the data used in them and in a few places there are some shortcomings. For example, on page 13 of the narrative it states that sea surface temperature (SST) and upwelling state will be used to estimate chlorophyll concentrations. Expecting to derive realistic chlorophyll concentrations from these primary data**

**may be a bit of a leap of faith. Further, when clouds preclude obtaining SST from satellites (a likely occurrence in the winter), nutrient state will be used to estimate chlorophyll concentrations. There is some uncertainty if the boundary of the models will restrict the focus of the study to the main stem of San Francisco Bay or allow the extension of the models deeper into the estuary and Delta.**

***Relevance to PSP Topic Areas:***

**High**

***TSP Technical Rating:***
**Above Average**

***TSP Funding Recommendation:***
**Fund w/conditions**

***TSP Amount Recommended:*** $**299,422**

***Conditions:***

**The panel rated this proposal as "highly" relevant based on the assumption that the boundary of the models will extend to the delta. If this is not the case, the panel strongly recommends the proponents extend their model boundaries.**

# External Technical Review #1

***Proposal Title:*** TRoUBLE? Trends of Rising and Unexpected Bloom Levels in the Estuary

***Proposal Number:*** 0022

***Proposal Applicant:*** United States Geological Survey

## Purpose

| | |
|---|---|
| **Comments** | **The goals and hypothese are clearly stated, developing a set of models to look at the results of light, grazing and offshore inputs and their mutual interactions to determine what is causing the trends in phytoplankton biomass. The idea is timely and the possible results could provide significant impact on our understanding of the pelagic ecosystem in the Bay. It is not clear if this project will contribute to understanding what is happening in Suisun Bay and the Delta.** |
| **Rating** | **Above Average** |

## Background

| | |
|---|---|
| **Comments** | **The conceptual model is clearly stated and provides the basis for the proposed work. The proposers have chosen a very simple conceptual model with one phytoplankton class and one zooplankton class. The conceptual model invokes bivalve grazing, but the proposed model must include bivalves as a parameter where as zooplankton grazing is the "predicted" grazer. No explanation for this choice is provided nor does the background information discuss the changes in zooplankton to support this simple model.** |
| **Rating** | **Above Average** |

## Approach

| | |
|---|---|
| **Comments** | **The authors present a reasonable plan for how they will develop and test the submodels before coupling in the 3d model. The details are sketchy on several key points. Extensive sensitivity studies are proposed to check parameterizations. While the datasets for forcing and testing are generally described, no metrics are provided to determine what parameterizations are adequate. There have been numerous open ocean studies looking at this problem using variational data assimilation or simulated annealing. The problem is not trivial since the parameters are varied in strongly nonlinear functions and the range of possible parameters is large. The initial work by Fasham and coworkers at Bermuda involved hundreds of runs to obtain a qualitative parameter set. Using the global NCEP reanalysis for the local forcing of the Bay is questionable. Topography is important on small scales for the wind, but not included in the global model. NCEP radiation and heat flux fields are problematic. No plan for dissemination of the model results is presented. The models will generate voluminous output which needs to be managed and made available to other researchers.** |
| **Rating** | **Above Average** |

## Feasibility

| | |
|---|---|
| **Comments** | **A critical reference for this project is Cloern 2006 which is an "in press' article and thus not available to the reviewer. The simple model needs further justification. The project is ambitious and the timeline is very tight. The coupled model runs will be done in the 3rd year which leaves very little time to synthesize the results of the runs.** |
| **Rating** | **Sufficient** |

## Budget

| | |
|---|---|
| Comments | The budget requests funds for salary and a small amount of money to buy a PC, compiler, software and the physical model license. Significant cost sharing by the USGS is proposed. It is not clear whether the budget will adequately support all of the activities needed for this project. No funds are alloted for data management, meeting travel, or publication costs. No funds or effort are allocated for distribution or a website for the model results. |
| Rating | Sufficient |

## Relevance To CALFED

| | |
|---|---|
| Comments | The authors clearly link their proposed work to the CALFED priorities. The modeling effort exploits the CALFED investment in monitoring and field work. The model could be a valuable tool for managing the Bay. |
| Rating | Superior |

## Qualifications

| | |
|---|---|
| Comments | The team of investigators are leaders in their fields. Infrastructure is the only reservation for this project. The authors propose to buy a high end PC for the project. The coupled model is computationally intensive.the Cauli and Walters reference indicates that a model without the ecosystem only ran at about 5 times real time on a 500 MHZ Dec Alpha. Even given the increase in clock speed, the coupled model will run at order 10 times real time. How will the number of simulations be performed in the time of the project? If other resources are available, then they should have been identified. |
| Rating | |

| | |
|---|---|
| | **Above Average** |

## Overall Evaluation Summary Rating

| | |
|---|---|
| **Comments** | **The proposal would be rated higher if it addressed two major concerns. The proposed work is ambitious and within the abilities of the research team. However, the timeline for the work seems too tight and key aspects of the work are not adequately defined. The simple model may give valuable insights, but its simplicity also reduces its ability to describe signifcant scenarios. The bivalve population has collapsed in the Bay while phytoplankton is increasing. The coupled model requires significant resources, but they are not identified and the coupled model study must be completed in the shortest amount of time.** |
| **Rating** | **Above Average** |

# External Technical Review #2

***Proposal Title:*** TRoUBLE? Trends of Rising and Unexpected Bloom Levels in the Estuary

***Proposal Number:*** 0022

***Proposal Applicant:*** United States Geological Survey

## Purpose

| | |
|---|---|
| **Comments** | **Purpose clearly defined. Well written proposal, internally consistent, adequate details for evaluation.** |
| **Rating** | **Superior** |

## Background

| | |
|---|---|
| **Comments** | **Conceptual model and underlying assumptions clearly stated and grounded in previous work by this group. Literature review a little heavy on their own work, could be broader.** |
| **Rating** | **Superior** |

## Approach

| | |
|---|---|
| **Comments** | **Approach is fine except that I am concerned by the ommission of benthic microalgae from the model. Changes in their abundance, which might be expected from changes in water clarity, could result in increased water column chlorophyll (due to resuspension) and alteration of nutrient resupply from selective uptake of nutrients regenerated in the sediment. The benthic box is treated as a net respiratory component for the model (probably fine for oxygen and maybe nutrients as a whole), but was not considered in supply of chlorophyll or nutrient ratios. It may not be important, but it would be useful to at lest explain why it is not considered** |
| **Rating** | |

| | |
|---|---|
| | **Above Average** |

## Feasibility

| | |
|---|---|
| **Comments** | **I am a little concerned that the project is essentially going to be done by a postdoc who has never worked in an estuarine system before. How long will it take her to get up to speed on the project? I have no doubt that she will receive adequate supervision and that she is capable of doing the work, but if you were starting with money in hand and looking for a postdoc, rather than vice versa, you'd probably chose a different postdoc.** |
| **Rating** | **Above Average** |

## Budget

| | |
|---|---|
| **Comments** | **budget is fine, cheap actually** |
| **Rating** | **Superior** |

## Relevance To CALFED

| | |
|---|---|
| **Comments** | **The proposal meets all of the integration and data mining objectives of the call for proposals, and is a nice cross disciplinary study. It should be an excellent exercise to generate hypotheses about bay functioning that can then tested empirically. I don't know where calfed is these days on the geographic limits of their purview, but it strikes me that the study area in this proposal – for the most part the Bay downstream of Chips Island – may be out of it. Yes there are linkages for specific organisms, but this is basically a Bay proposal.** |
| **Rating** | **Superior** |

## Qualifications

| | |
|---|---|
| **Comments** | **Excellent, except for the concerns raised above about the postdoc to be put in charge of** |

| | |
|---|---|
| | **the project. I have no idea who this person is and whether or not she's the greatest thing since sliced bread, but based on her experience as a grad student as indicated by her CV, there might be persons with more appropriate backgrounds to lead this effort. It also seems like a pretty big project and responsibility to be dumping on a recent graduate. Who gets stuck with all the administrative BS? She's not going to know how to do that, even if she were a cracker-jack programmer who was intimately familiar with estuaries in general and the Bay in particular. Hopefully the other PIs are prepared to step in as needed** |
| **Rating** | **Above Average** |

## Overall Evaluation Summary Rating

| | |
|---|---|
| **Comments** | **I think my evaluation is obvious from the above. I like the project but I have some concerns about some of the details of its scope. I am a little worried about the composition of the research team, but I trust the senior PIs to fill in where needed to support the post doc. My main question, which is one CalFed has to answer, is whether or not the geographic scope of the project fits into their purview. That said, I am sure that a lot more knowledge of value in a borader context will come out of this project than might come out of others that are more geographically appropriate.** |
| **Rating** | **Superior** |

# External Technical Review #3

***Proposal Title:*** TRoUBLE? Trends of Rising and Unexpected Bloom Levels in the Estuary

***Proposal Number:*** 0022

***Proposal Applicant:*** United States Geological Survey

## Purpose

| | |
|---|---|
| **Comments** | **The goal is to improve understanding of phytoplankton dynamics in SF Bay. The project would test four hypotheses formulated to answer questions about the underlying mechanisms for changes in phytoplankton dynamics since the late 1990s. The goals, objectives, and hypotheses are clearly stated and are consistent with each other and with the proposal's background information and conceptual models.**<br><br>**The work proposed here is timely in that it responds to recent trends whose causes are not yet understood. These trends would not have been observed without the routine monitoring program that has been in place for some three decades. The work is potentially important because it may inform efforts to link ecological processes in the Delta and the rivers to processes that unfold in the Bay. These linkages are particularly important to the species that use more than one part of the whole system, e.g., salmon and delta smelt.**<br><br>**The study uses existing routine monitoring data, the data from a special study conducted in 1980 (to calibrate the NPZ model) and equations already built into existing models. If the model fails, it will indicate a shortcoming in existing knowledge; if it predicts accurately the future behavior of the system, then it will give us greater confidence in our existing knowledge.** |

| | |
|---|---|
| | **The most novel part of the proposed study is the linkage with the coastal part of the system. This sub-task will lead to new ways of incorporating new and old information into modeling the phytoplankton dynamics of the estuary. The other elements of the study will be employing already well-established methods and approaches.** |
| **Rating** | **Superior** |

## Background

| | |
|---|---|
| **Comments** | **The conceptual model is clearly stated and is backed up with enough information to understand its main points. A list of citations is also provided that allows one to dig deeper if desired, but this step is not requried to get the jist of the conceptual model.** |
| **Rating** | **Superior** |

## Approach

| | |
|---|---|
| **Comments** | **The approach is well suited to meeting the objectives of this kind of numerical modeling study. The approach starts with the development of an ecological model (the NPZ Stella model), then a hydrodynamic model and then a coupling of the two submodels (probably the most difficult task). The management team and responsible parties are clearly identified as are the adminstrative tasks. The budget includes sufficient funds for these project management tasks.**<br><br>**The main products of this study will be a final report, science conference presentations and peer-reviewed journal articles. These products have scientific value and could conceivably help inform efforts to improve ecosystem quality, water quality, levee stability or water supply reliability.**<br><br>**The plan for disseminating results is specified under 'Schedule of Deliverables' and meets the minimum requirements of the PSP. The body of the proposal** |

| | |
|---|---|
| | **contains no elaboration on how the understanding gained from this study will be disseminated or whether the data it ends up compiling will be shared with the broader scientific community. Given that one justification of the proposal is to expand the geographic scope of a heretofore 'Delta−centric' Calfed science program, it seems appropriate that the Bay and coastal data brought together for this modeling exercise be incorporated into the BDAT database which houses data for the rivers and the Delta and some areas of the Bay. This task was beyond the scope of this proposal, but might be considered in the future.** |
| **Rating** | **Superior** |

## Feasibility

| | |
|---|---|
| **Comments** | **The approach is well documented and technically feasible, although as the proponents point out, this is an ambitious undertaking. Given the track record of the researchers involved and the facilities, tools and other resources available to them, there is a better than fifty fifty chance that a coupled (hydrodynamic−NPZ) numerical model will be successfully calibrated and verified within three years. The project schedule allots enough time (six months) for synthesizing and writing up the results.**<br><br>**I noted one potential problem with the study design. Specifically, it is proposed to calibrate the 2−box ecological part of the model using the data collected by USGS in 1980 (p. 11). The same data set appears in the list of data to be used in validating the model (p.14).**<br><br>**This team is well qualified for this undertaking.** |
| **Rating** | **Superior** |

## Budget

| | |
|---|---|
| **Comments** | **The budget breaks down the costs into clearly defined categories that include salaries, benefits, overhead and equipment by task and for the project as a whole. I could not, however, make out how the USGS cost share portion of the total budget will be spent as required in Chapter 3, Section D of the PSP. Also, the proposal does not state whether the remote sensing imagery is free or will need to be purchased.**<br><br>**The requested funds seem reasonable and adequate for the proposed work. The overhead rate (54%) seems low for a USGS project.** |
| **Rating** | **Above Average** |

## Relevance To CALFED

| | |
|---|---|
| **Comments** | **The proposal falls under two of the stated priorities in the PSP and addresses a number of other priorities, including integration, synthesis and application of existing information. The project is inherently multi-disciplinary and will yield a calibrated numerical model.**<br><br>**It is difficult to predict how the model or the information it brings together might prove to be to Calfed as it develops and evaluates ideas for restoring ecosystem quality, water quality, levee stability and water supply reliability. Of the four overarching goals, the most likely application would be in the context of ecosystem quality. Perhaps, one way to assess the future utility of this modeling exercise would be to ask Calfed resource managers and policy makers how useful previous efforts to model the Bay and the Delta have been to their past deliberations.** |
| **Rating** | |

| | |
|---|---|
| | **Above Average** |

## Qualifications

| | |
|---|---|
| **Comments** | **The credentials of the senior members of the project team are unimpeachable. The post-doc who will bear most of the responsibilty for carrying out the project has previous experience with coupled hydrodynamic-pelagic zone models and will be backed up by a solid team of advisors from USGS and Stanford University and many of the resources available at these institutions.** |
| **Rating** | **Superior** |

## Overall Evaluation Summary Rating

| | |
|---|---|
| **Comments** | **Overall, this proposal merits a rating of 'Superior'. The proposal clearly states its goals and objectives (to further understanding and to test four hypoetheses about what drivers might be responsible for recent changes in phytoplankton dynamics in the Bay), the approach and methods for achieving the objectives and a plan for disseminating the results. The team assembled for this task has decades of experience working in the estuary and has received a number of Calfed Science Program grants over the last ten years. The project has a good chance of success and may be of some utility to Calfed in its efforts to improve the quality of the Bay-Delta-River ecosystem.** |
| **Rating** | **Superior** |